PATENT ABSTRACTS OF JAPAN

(11)Publication number : **09-114931**

(43)Date of publication of application : **02.05.1997**

(51)Int.Cl. **G06K 9/62**
G06K 9/62

(21)Application number : **07-269826**

(22)Date of filing : **18.10.1995**

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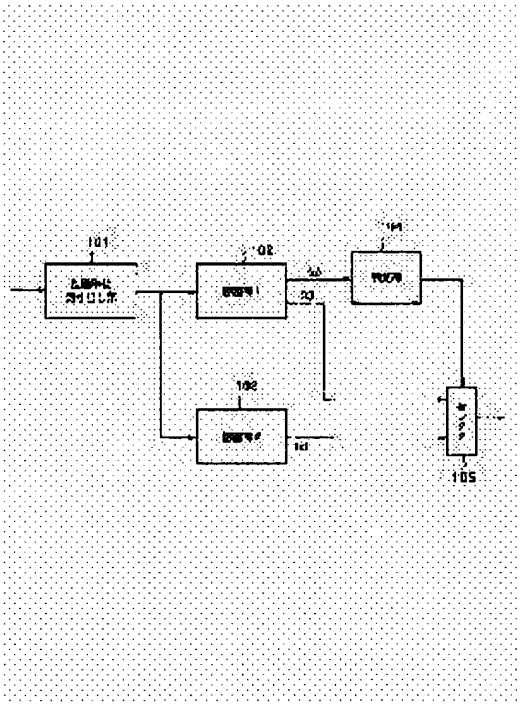
(54) DEVICE AND METHOD FOR RECOGNIZING CHARACTER

(57)Abstract:

PROBLEM TO BE SOLVED: To enable the character recognition of characters used for respective plural languages and to accelerate the processing speed of character recognition.

SOLUTION: This device is provided with recognizing parts 1 (102) and 2 (103) for recognizing the characters respectively used for Japanese and English, and concerning image data, the recognition is executed by the respective recognizing parts. The recognition rates of the respective recognized results are acquired, the respective acquired recognition rates are judged by a judging part 104 and based on that judgement, any one of the recognized results is selected by a selector 105. Then, the selected recognized result is outputted.



LEGAL STATUS

[Date of request for examination]

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision of rejection]

[Date of requesting appeal against examiner's decision of rejection]

[Date of extinction of right]

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CLAIMS

[Claim(s)]
[Claim 1] A character reader which performs character recognition of image data which reads a manuscript and is obtained characterized by providing the following Two or more recognition means to recognize an alphabetic character used by each of two or more kinds of language An activation means to perform recognition by said two or more recognition means about said image data An acquisition means to acquire a recognition rate of each recognition result obtained by recognition by said recognition means A selection means to choose any one of two or more of the recognition results based on said two or more recognition rates acquired by said acquisition means, and an output means to output a recognition result chosen by said selection means
[Claim 2] Said selection means is a character reader according to claim 1 which is further equipped with a comparison means to compare each recognition rate of two or more of said recognition results, and is characterized by a recognition rate choosing highest recognition result as a result of a comparison of said comparison means.
[Claim 3] Said selection means is a character reader according to claim 1 which is further equipped with a comparison means to compare each recognition rate of said recognition result with a predetermined threshold, and is characterized by choosing a large recognition result from said predetermined threshold as a result of a comparison of said comparison means.
[Claim 4] A character reader according to claim 1 characterized by having further a separation means to divide said image data into a field for every attribute, based on the attribute of image data read by reading means to read said manuscript optically, and the aforementioned reading means.
[Claim 5] Said recognition means is a character reader according to claim 4 characterized by recognizing a field whose attribute of a field separated by said separation means is an alphabetic character as image data.
[Claim 6] A character reader according to claim 4 characterized by having further a division means to divide said field in a predetermined unit.
[Claim 7] Said predetermined unit is a character reader according to claim 6 characterized by including a line and an alphabetic character at least.
[Claim 8] A character reader characterized by providing the following. Two or more recognition means to be the character reader which performs character recognition of image data which reads a manuscript and is obtained, and to recognize an alphabetic character used by each of two or more kinds of language An activation means to choose one of said two or more of the recognition means, and to perform recognition of said image data based on a recognition means chosen An acquisition means to acquire a recognition rate of a recognition result obtained according to recognition of said recognition means A comparison means compare with a predetermined threshold said recognition rate acquired by said acquisition means, an output means output said recognition result as a result of a comparison of said comparison means when said recognition rate is larger than said predetermined threshold, and the control means that control so that selection of said recognition means is switched one by one and activation of said activation means is made until an output by said output means is obtained
[Claim 9] It is the character reader according to claim 8 which is further equipped with a setting means to set up use sequence of said recognition means, and is characterized by switching said switch according to sequence set up with said setting means.
[Claim 10] A character reader according to claim 8 characterized by having further a separation means to divide said image data into a field for every attribute, based on the attribute of image data read by reading means to read said manuscript optically, and the aforementioned reading means.
[Claim 11] Said recognition means is a character reader according to claim 10 characterized by recognizing a field

whose attribute of a field separated by said separation means is an alphabetic character as image data.
[Claim 12] A character reader according to claim 10 characterized by having further a division means to divide said field in a predetermined unit.
[Claim 13] Said predetermined unit is a character reader according to claim 12 characterized by including a line and an alphabetic character at least.
[Claim 14] A character recognition method of performing character recognition of image data which reads a manuscript and is obtained characterized by providing the following Two or more recognition production processes of recognizing an alphabetic character used by each of two or more kinds of language An activation production process which performs recognition by said two or more recognition production processes about said image data An acquisition production process which acquires a recognition rate of each recognition result obtained by recognition by said recognition production process A selection production process which chooses any one of two or more of the recognition results based on said two or more recognition rates acquired according to said acquisition production process, and an output production process which outputs a recognition result chosen by said selection production process
[Claim 15] Said selection production process is the character recognition method according to claim 14 which is further equipped with a comparison production process which compares each recognition rate of two or more of said recognition results, and is characterized by a recognition rate choosing highest recognition result as a result of a comparison of said comparison production process.
[Claim 16] Said selection production process is the character recognition method according to claim 14 which is further equipped with a comparison production process which compares each recognition rate of said recognition result with a predetermined threshold, and is characterized by choosing a large recognition result from said predetermined threshold as a result of a comparison of said comparison production process.
[Claim 17] A character recognition method according to claim 14 characterized by having further a separation production process which divides said image data into a field for every attribute based on the attribute of image data read according to a reading production process which reads said manuscript optically, and the aforementioned reading production process.
[Claim 18] Said recognition production process is the character recognition method according to claim 17 characterized by recognizing a field whose attribute of a field separated by said separation means is an alphabetic character as image data.
[Claim 19] A character recognition method according to claim 17 characterized by having further a division production process which divides said field in a predetermined unit.
[Claim 20] Said predetermined unit is the character recognition method according to claim 19 characterized by including a line and an alphabetic character at least.
[Claim 21] A character recognition method characterized by providing the following. Two or more recognition production processes of being the character recognition method of performing character recognition of image data which reads a manuscript and is obtained, and recognizing an alphabetic character used by each of two or more kinds of language An activation production process which chooses one of said two or more of the recognition production processes, and performs recognition of said image data based on a recognition production process chosen An acquisition production process which acquires a recognition rate of a recognition result obtained according to recognition of said recognition production process The comparison production process which compares with a predetermined threshold said recognition rate acquired according to said acquisition production process, the output production process which output said recognition result as a result of a comparison of said comparison production process when said recognition rate is larger than said predetermined threshold, and the control production process which control so that selection of said recognition production process is switched one by one and activation of said activation production process is made until an output by said output production process is obtained
[Claim 22] It is the character recognition method according to claim 17 which is further equipped with a setting production process which sets up use sequence of said recognition production process, and is characterized by switching said switch according to sequence set up at said setting production process.
[Claim 23] A character recognition method according to claim 21 characterized by having further a separation production process which divides said image data into a field for every attribute based on the attribute of image data read according to a reading production process which reads said manuscript optically, and the aforementioned reading production process.
[Claim 24] Said recognition production process is the character recognition method according to claim 23

characterized by recognizing a field whose attribute of a field separated according to said separation production process is an alphabetic character as image data.
[Claim 25] A character recognition method according to claim 23 characterized by having further a division production process which divides said field in a predetermined unit.
[Claim 26] Said predetermined unit is the character recognition method according to claim 25 characterized by including a line and an alphabetic character at least.
[Claim 27] Computer-readable memory in which a program of character recognition processing characterized by providing the following was stored A procedure code of two or more recognition production processes of recognizing an alphabetic character used by each of two or more kinds of language A procedure code of an activation production process which performs recognition by said two or more recognition production processes about said image data A procedure code of an acquisition production process which acquires a recognition rate of each recognition result obtained by recognition by said recognition production process A procedure code of a selection production process which chooses any one of two or more of the recognition results based on said two or more recognition rates acquired according to said acquisition production process, and a procedure code of an output production process which outputs a recognition result chosen by said selection production process
[Claim 28] Computer-readable memory characterized by providing the following. A procedure code of two or more recognition production processes of being the computer-readable memory in which a program of character recognition processing was stored, and recognizing an alphabetic character used by each of two or more kinds of language A procedure code of an activation production process which chooses one of said two or more of the recognition production processes, and performs recognition of said image data based on a recognition production process chosen A procedure code of an acquisition production process which acquires a recognition rate of a recognition result obtained according to recognition of said recognition production process The procedure code of the comparison production process which compares with a predetermined threshold said recognition rate acquired according to said acquisition production process, the procedure code of the output production process which outputs said recognition result as a result of the comparison of said comparison production process when said recognition rate is large than said predetermined threshold, and the procedure code of the control production process which controls so that selection of said recognition production process switches one by one and activation of said activation production process is made until an output by said output production process is obtained

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[The technical field to which invention belongs] This invention relates to the character reader which performs character recognition of the image data which reads a manuscript and is obtained, and its method.
[0002]
[Description of the Prior Art] Electronization of the information to which information management and retrieval become easy in the modern society with which information overflows is desired immediately. To informational electronization, OCR (optical character recognition) which recognizes the alphabetic character and is changed into a character code when especially an image is an alphabetic character is indispensable in the image read with readers, such as a scanner, and the precision has been improving rapidly to it.
[0003] in a reader equipped with OCR, when two or more kinds of alphabetic characters from which language differs with the equipment simple substance have been recognized, because of the difference in the property of each language, each language was not able to be boiled with a sufficient precision and has not been recognized. For example, by OCR only for Japanese, when the alphabet has been recognized, since the property differs from Japanese remarkably, especially the small letter of the alphabet has not been recognized.
[0004] Therefore, with one reader, in order to recognize two or more kinds of language, the recognition algorithm according to language was prepared, respectively, and accurate character recognition was performed because a user switches and uses the recognition algorithm corresponding to the language with an input unit etc. for every language. Moreover, a recognition algorithm is that a user changes the dictionary of the language corresponding to the alphabetic character made to recognize whenever [same] it recognizes by storing the dictionary of each alphabetic character in equipment beforehand but from input units, such as an operation panel, and was performing character recognition of each language. Furthermore, it also needed to be controlled for changing each dictionary.
[0005]
[Problem(s) to be Solved by the Invention] However, the time and effort of the method [of performing character recognition of two or more kinds of language while a user performs the directions which switch the dictionary of each language using input units, such as an operation panel,] of a user increased, and it had the trouble of reducing processing speed. Moreover, when there were two or more reading manuscripts, in order to reduce substitution actuation of the manuscript, ADF (auto document feeder) was used and character recognition was performed. In that case, when the English manuscript and the Japanese manuscript were mixed in two or more reading manuscripts, whenever it read one reading manuscript, the user had to be directed and there was spoiling the advantage of ADF and a trouble of reducing processing speed as a result.
[0006] It aims at offering the character reader which this invention is made in view of the above-mentioned trouble, and makes possible character recognition of the alphabetic character used for each of two or more language, and improves the processing speed of character recognition, and its method.
[0007]
[The means for solving invention] The character reader by this invention for attaining the above-mentioned purpose is equipped with the following configurations. Namely, two or more recognition means to be the character reader which performs character recognition of the image data which reads a manuscript and is obtained, and to recognize the alphabetic character used by each of two or more kinds of language, An activation means to perform recognition by said two or more recognition means about said image data, An acquisition means to acquire the recognition rate of each recognition result obtained by recognition by said recognition means, Based on said two or more recognition

rates acquired by said acquisition means, it has a selection means to choose any one of two or more of the recognition results, and an output means to output the recognition result chosen by said selection means.
[0008] Moreover, preferably, said selection means is further equipped with a comparison means to compare each recognition rate of two or more of said recognition results, and chooses a recognition result with the highest recognition rate as a result of the comparison of said comparison means. It is because accurate character recognition can be performed by choosing the recognition result of the highest recognition rate.
[0009] Moreover, preferably, said selection means is further equipped with a comparison means to compare each recognition rate of said recognition result with a predetermined threshold, and chooses a large recognition result from said predetermined threshold as a result of the comparison of said comparison means. Moreover, based on the attribute of the image data preferably read by reading means to read said manuscript optically, and the aforementioned reading means, it has further a separation means to divide said image data into the field for every attribute.
[0010] Moreover, said recognition means recognizes preferably the field whose attribute of the field separated by said separation means is an alphabetic character as image data. Moreover, it has further preferably a division means to divide said field in a predetermined unit. Moreover, said predetermined unit contains a line and an alphabetic character at least preferably.
[0011] The character reader by this invention for attaining the above-mentioned purpose is equipped with other following configurations. Namely, two or more recognition means to be the character reader which performs character recognition of the image data which reads a manuscript and is obtained, and to recognize the alphabetic character used by each of two or more kinds of language, An activation means to choose one of said two or more of the recognition means, and to perform recognition of said image data based on the recognition means chosen, An acquisition means to acquire the recognition rate of the recognition result obtained according to recognition of said recognition means, A comparison means to compare with a predetermined threshold said recognition rate acquired by said acquisition means, It has an output means to output said recognition result as a result of the comparison of said comparison means when said recognition rate is larger than said predetermined threshold, and the control means controlled so that selection of said recognition means is switched one by one and activation of said activation means is made until the output by said output means is obtained.
[0012] Moreover, it has further preferably a setting means to set up the use sequence of said recognition means, and said switch is switched according to the sequence set up with said setting means. It is because processing speed can be improved by switching sequence according to a user's use. Moreover, based on the attribute of the image data preferably read by reading means to read said manuscript optically, and the aforementioned reading means, it has further a separation means to divide said image data into the field for every attribute.
[0013] Moreover, said recognition means recognizes preferably the field whose attribute of the field separated by said separation means is an alphabetic character as image data. Moreover, it has further preferably a division means to divide said field in a predetermined unit. Moreover, said predetermined unit contains a line and an alphabetic character at least preferably.
[0014] The character recognition method by this invention for attaining the above-mentioned purpose is equipped with the following configurations. Namely, two or more recognition production processes of being the character recognition method of performing character recognition of the image data which reads a manuscript and is obtained, and recognizing the alphabetic character used by each of two or more kinds of language, The activation production process which performs recognition by said two or more recognition production processes about said image data, The acquisition production process which acquires the recognition rate of each recognition result obtained by recognition by said recognition production process, The character recognition method characterized by having the selection production process which chooses any one of two or more of the recognition results, and the output production process which outputs the recognition result chosen by said selection production process based on said two or more recognition rates acquired according to said acquisition production process.
[0015] It has other following configurations for the character recognition method by this invention for attaining the above-mentioned purpose. Namely, two or more recognition production processes of being the character recognition method of performing character recognition of the image data which reads a manuscript and is obtained, and recognizing the alphabetic character used by each of two or more kinds of language, The activation production process which chooses one of said two or more of the recognition production processes, and performs recognition of said image data based on the recognition production process chosen, The acquisition production process which acquires the recognition rate of the recognition result obtained according to recognition of said recognition production

process, The comparison production process which compares with a predetermined threshold said recognition rate acquired according to said acquisition production process, It has the output production process which outputs said recognition result as a result of the comparison of said comparison production process when said recognition rate is larger than said predetermined threshold, and the control production process controlled so that selection of said recognition production process is switched one by one and activation of said activation production process is made until the output by said output production process is obtained.

[0016] The computer-readable memory by this invention for attaining the above-mentioned purpose is equipped with the following configurations. Namely, the procedure code of two or more recognition production processes of being the computer-readable memory in which the program of character recognition processing was stored, and recognizing the alphabetic character used by each of two or more kinds of language, The procedure code of the activation production process which performs recognition by said two or more recognition production processes about said image data, The procedure code of the acquisition production process which acquires the recognition rate of each recognition result obtained by recognition by said recognition production process, Based on said two or more recognition rates acquired according to said acquisition production process, it has the procedure code of the selection production process which chooses any one of two or more of the recognition results, and the procedure code of the output production process which outputs the recognition result chosen by said selection production process.

[0017] The computer-readable memory by this invention for attaining the above-mentioned purpose is equipped with other following configurations. Namely, the procedure code of two or more recognition production processes of being the computer-readable memory in which the program of character recognition processing was stored, and recognizing the alphabetic character used by each of two or more kinds of language, The procedure code of the activation production process which chooses one of said two or more of the recognition production processes, and performs recognition of said image data based on the recognition production process chosen, The procedure code of the acquisition production process which acquires the recognition rate of the recognition result obtained according to recognition of said recognition production process, The procedure code of the comparison production process which compares with a predetermined threshold said recognition rate acquired according to said acquisition production process, Until the procedure code of the output production process which outputs said recognition result, and the output by said output production process are obtained as a result of the comparison of said comparison production process, when said recognition rate is larger than said predetermined threshold It has the procedure code of the control production process controlled so that selection of said recognition production process is switched one by one and activation of said activation production process is made.

[0018]

[Embodiment of the Invention] Hereafter, the gestalt of suitable operation of this invention is explained to details with reference to a drawing.

<Gestalt 1 of operation> drawing 1 is the block diagram showing the configuration of the character reader of the gestalt 1 of operation. In this drawing, 111 is CPU and performs various control of RAM113, a keyboard 114, the character recognition section 115, a display 116, the Records Department 117, and a read station 118 according to the program memorized by ROM112. 112 is ROM and stores the various programs for performing processing of the data inputted from a keyboard 114, and character recognition of the character recognition section 115. 113 is RAM and is a shunting field the working area of the data inputted from various programs or a keyboard 114, and temporarily.

[0019] 114 is a keyboard and performs the directions and the entry of data of initiation of character recognition which are mentioned later. 115 is the character recognition section and performs processing explained with the flow chart of drawing 3 mentioned later. 116 is a display and displays the recognition result and processing condition of the character recognition section 115. 117 is the Records Department, is directions by a user's keyboard 114, and records the recognition result of the character recognition section etc. on a record medium.

[0020] 118 is a read station and is a read station which consists of an optical character reader (OCR) which reads an image optically. Moreover, the read image data presupposes that it is binary 1-pixel 1-bit image made simple binary. Furthermore, the read image data is developed by RAM11 as a bitmapped image of 1 bitwise, and processing explained with the flow chart of drawing 3 mentioned later is performed.

[0021] In addition, when the inclination has arisen in the image data read by the read station 118, before performing character recognition processing, a better result can be obtained by amending the inclination of image data to the image data to which the manuscript inclined. What is necessary is to ask for the inclination of the extracted line as the amendment method of an inclination, for example, and just to perform coordinate transformation which loses the inclination.

[0022] It is FDD (floppy disk drive), and 119 equips with FD and R/W of data is possible for it. Moreover, the program of the flow chart later mentioned to FD (un-illustrating) with which it was equipped can be written in, and processing can also be performed by reading this program into RAM112 of this equipment. In addition, it is also easily possible to perform processing by reading the program which CD-ROM and HD which are equipped with a CD-ROM driver or HDD instead of, and are equipped with or built in each driver were made to memorize an above-mentioned program, and was memorized. [FDD119]
[0023] 120 is a CPU bus and connects the component of a character reader mutually. In addition, the reading manuscript read by the read station 118 presupposes that it is the manuscript with which Japanese, English or Japanese, and English mingled with the gestalt 1 of operation. Next, detailed explanation of the character recognition section 115 is explained using drawing 2 . Drawing 2 is the block diagram showing the detailed configuration of the character recognition section 115 of the gestalt 1 of operation.
[0024] 101 is the recognition unit logging section, and in order to perform recognition of the image data read by the read station 118 for every recognition unit with predetermined magnitude, it divides image data into two or more blocks. In addition, recognition units are the line which divided the alphabetic block which is the assembly of the alphabetic character occupied in a predetermined field according to the field separation which mentions for example, a reading image later, or the alphabetic block per line, and a certain alphabetic character which was and divided the limping gait per alphabetic character.
[0025] 102 is the recognition section 1 which performs Japanese character recognition, and recognizes the image data divided by the recognition unit logging section 101 for every recognition unit. Moreover, as a result of having been recognized in the recognition section 1 (102), the recognition result 1 ((b) of drawing 2) is outputted to a selector 105. Furthermore, C1 ((a) of drawing 2) is outputted to the judgment section 104 whenever [recognition confidence / which shows the probability of the recognition result 1].
[0026] 103 is the recognition section 2 which performs English character recognition, and recognizes the image data divided by the recognition unit logging section 101 for every recognition unit. Moreover, as a result of having been recognized in the recognition section 2 (103), the recognition result 2 ((c) of drawing 2) is outputted to a selector 105. 104 is the judgment section, inputs C1 ((a) of drawing 2) whenever [recognition confidence / which was outputted by the recognition section 1 (102)], and outputs a 1-bit judgment signal to a selector 105 based on the value. In addition, the judgment signal outputted in the judgment section 104 compares C1 with the predetermined threshold T1 for example, whenever [recognition confidence], whenever [recognition confidence], when C1 is larger than a threshold T1, it outputs "1", and when small, it outputs "0." Moreover, 1 bit of high orders of C is taken whenever [confidence], and it is good also considering it as a judgment signal.
[0027] 105 is a selector and the judgment signal judged by the recognition result 2 and the judgment section 104 which have been recognized by the recognition result 1 recognized by the recognition section 1 (102) and the recognition section 2 (103) is inputted. Based on the judgment signal inputted from the judgment section 104, either the recognition result 1 or the recognition result 2 is chosen, and it is outputted as a recognition result.
[0028] Next, the processing in the gestalt 1 of operation is explained using the flow chart of drawing 3 . Drawing 3 is a flow chart which shows the processing flow of the gestalt 1 of operation. In addition, let the recognition unit divided into the recognition unit logging section 101 be a "line" with the gestalt 1 of operation.
[0029] At step S1101, the image data read from the read station 118 is divided into a block as shown below by field separation processing. For example, the image data read from the read station 118 presupposes that it was a thing as shown in (a) of drawing 4 . The processing which performs a class division as this image data is shown in (b) of drawing 4 according to the class (for example, a title, a text, drawing, a picture) of image data is field separation. Here, the processing flow of field separation processing is explained using the flow chart of drawing 5 .
[0030] At step S301, the read image data is received for every field of a mxn pixel unit, window ring processing is performed, and resolution conversion which makes resolution low is performed to the degree which the image data in the field connects in a field with at least 1 pixel of black dots. For example, if resolution conversion is performed to the image data shown in (a) of drawing 4 , it will become an image as shown in drawing 6 .
[0031] In addition, the field obtained by the isolated dot clearly understood to be a noise is eliminated with pattern matching etc. for example, after window ring processing. At step S302, the border-line trace for grasping the feature of the border line of each image is performed to the image by which resolution conversion was carried out. By this processing, when the feature of a border line is a long and slender pattern, it is judged with a text or a title, and when other, it can distinguish as a graphic form or a picture.
[0032] At step S303, when the image of the same class adjoins, connection processing which connects adjoining

images is performed. By this processing, field separation processing of drawing 4 as shown in (b) completes the image data of (a) of drawing 4 . In addition, the block data which shows the arrangement relation of the data structure which shows the class of image data as shown in (a) of drawing 7 at the time of this completion of field separation processing etc., and the block by which field separation was carried out as shown in (b) of drawing 7 is obtained. Moreover, according to this data structure and block data, the information in connection with processing of the sequence which character recognition recognizes is acquired suitably.

[0033] The data structure of (a) of drawing 7 and the block data of (b) are explained. First, the data structure shown by (a) of drawing 7 is defining the address (strucut BLOCK *next_address) which determines the sequence of the class (short type of drawing) of block (struct BLOCK), physical relationship (short startx of drawing, starty), the width of face of each block and height (short width of drawing, height), and each block divided according to field separation.

[0034] With drawing, it is defined as 0=TYTLE (title), 1=TEXT (text), 2=FIGURE (drawing), and 3=PICTURE (picture) as a class of block. The numeric character defined as each block is used with block data as a class of block determined according to field separation. Moreover, the physical relationship of each block is the physical relationship over x and a y-coordinate as shown in (b) of drawing 4 , startx is the x-coordinate of each block and starty is the y-coordinate of each block. In addition, the location of each block is made into the location of each block of the angle (angle shown by - mark of (b) of drawing 4) which has the position relation of each block. Furthermore, the width of face of each block and height are x lay length (width of face defined by width) of each block, and are y lay length (height defined by height).

[0035] Since the image data shown by (a) of drawing 4 is divided into five blocks (refer to (b) of drawing 4) by field separation as shown in (b) of drawing 5 , BLK[0] -BLK[4] is given as sequence (address) of processing of each block. And the class of block explained by (a) of drawing 7 , a coordinate, its width of face, height, and the address of the block which should be processed further next are shown by each block.

[0036] For example, if BLK [0] explains, supposing the block shown by BLK [0] is the text of (b) of drawing 4 , type which is the class of block will be set to "0." Moreover, starty whose startx which is x-coordinates as a location is "500" and a y-coordinate is set to "300." Furthermore, height whose width(s) which are width of face are "1500" and height is set to "250." Furthermore, next_address which is the address of the block which should be processed next becomes "&BLK[1]" again. Similarly, BLK[1] -BLK[4] is also explained. In addition, since the block which should be processed next does not exist about the block (drawing BLK [4]) processed at the end, next_address which is the address of the block which should be processed next serves as "NULL."

[0037] It returns to explanation of the flow chart of drawing 3 . It judges whether the processing after step S1103 explained below at step 1102 about each block divided according to field separation at step 1101 is completed. That is, processing is performed according to the sequence of each block, and when processing of a block in which next_address is "NULL" is completed, it means that the processing in all blocks was completed.

[0038] It judges whether it is that the block which is going to carry out current processing contains the alphabetic character at step S1103 (type is "0" or "1"). When the alphabetic character is included (it is YES at step S1103), it progresses to step S1104. When the alphabetic character is not included (it is NO at step S1103), it returns to step S1102. At step S1104, the y-axis (line) in which projection is performed in the direction of the y-axis, and an alphabetic character exists the image data within a block (alphabetic character) is extracted. If it carries out to the text 2 of (b) of drawing 4 as an example of the projection of direction HE of the y-axis, to the portion (line) which has an alphabetic character as shown in drawing 8 , projection will appear on y'. The projection method of concrete direction HE of the y-axis is explained using the flow chart of drawing 9 .

[0039] Drawing 9 is a flow chart which shows the processing flow of the projection method of direction HE of the y-axis of the gestalt 1 of operation. In addition, since the alphabetic character which exists in each block is a 1-bit bitmapped image, the projection to the direction of the y-axis is "black" about the image within a block in 1 bitwise, or it is searched, judging "white", and is performed based on the judgment and retrieval result. Moreover, at the processing initiation time of the projection to the direction of the y-axis, initialization of a value explained at step S901 - step S905 is performed.

[0040] nline which shows the line count which it has to the block in the block containing the image data of an alphabetic character at step S901 is reset. The flag flag which distinguishes whether certain it is and the end of a limping gait is searched for whether the beginning of a line is searched with step S902 is reset. At step S903, the counter j which counts the count of retrieval of the direction of y is reset. At step S904, the counter i which counts the count of retrieval of x directions is reset. The flag kuro which shows whether the pixel located in the value which

Counter i shows at step S905 is black is reset.
[0041] At step S906, it judges whether the pixel located in a coordinate (startx+i, starty+j) is black. When a pixel is black (it is NO at step S906), it progresses to step S907. When a pixel is not black (it is NO at step S906) (i.e., when it is white), it progresses to step S911. At step S911, startx+i judges whether it is larger than the width of face width of a block. When large (it is NO at step S911), it progresses to step S912. When small (it is YES at step S911), it progresses to step S916. At step S916, the value of i is incremented +one time and it returns to step S906.
[0042] On the other hand, 1 is set to kuro at step S907. at step S908, it judges whether flag is "0" (it is the mode in which the beginning of a line is looked for -- do thing or not?). When flag is "0" (it is YES at step S908), it progresses to step S909. When flag is not "0" (it is NO at step S908), it progresses to step S912.
[0043] At step S909, a y-coordinate assigns the value of j to line_sy [nline] which shows Rhine which is starty+j. flag is changed into "1" at step S910. At step S912, kuro judges whether "0" (there being no black pixel in the Rhine) and flag are "1" (mode in which the end of a line is looked for). kuro progresses to step S913, when "0" and flag are "1" (it is YES at step S912). kuro progresses to step S917, when "0" and flag are not "1" (it is NO at step S912).
[0044] Start location line_sy [nline] of the line is substituted for line_h [nline] which shows the nline position row height extracted by projection at step S913 from j which is current processing Rhine. At step S914, flag which shows whether it is line sampling is returned to the mode in which the beginning of a line is looked for, +1 ink RIMETO of the nline which shows a line count at step S915 is carried out, and it flies to step S917. On the other hand, when "0" and flag are not "1" (it is NO at step S912), they fly to step S917 and increment the value of j +one time, and kuro returns to step S904.
[0045] Processing of the above drawing 9 can extract a line count, the starting point of each line, and height from an alphabetic character image. In addition, although the extract method of a line explained with the flow chart of drawing was extracting the y-axis (line) in which projection is performed in the direction of the y-axis, and an alphabetic character exists the image data within a block (alphabetic character), it is not restricted to this. For example, although a long and slender thing is judged among the objects extracted by the border-line trace to be an alphabetic character after performing a border-line trace of step S302 of the flow chart of drawing 5 , field separation is performed as a line at step S303, without performing same group association. If this processing is performed to the image data of (a) of drawing 4 , it will become like drawing 10 and a line will be extracted at the time of field separation. However, since the precision of the line extracted in the case of resolution conversion is low, the value of the predetermined threshold T1 in consideration of the precision must be set up.
[0046] It returns to explanation of the flow chart of drawing 3 . It judges whether it is the no which recognition processing of each line extracted at step S1104 ended at step S1105. When recognition processing of all lines is completed (it is NO at step S1105), it progresses to step S1102. When having not ended (it is YES at step S1105), it progresses to step S1106.
[0047] At step S1106, by the recognition section 1, character recognition of a line unit is performed and C1 is calculated whenever [recognition result 1 and recognition confidence]. In the recognition section 2, character recognition of a line unit is performed to coincidence, and it is asked for the recognition result 2. At step S1108, C1 judges whether it is larger than the predetermined threshold T1 whenever [recognition confidence]. Whenever [recognition confidence], when C1 is larger than the predetermined threshold T1 (it is YES at step S1108), it progresses to step S1109. Whenever [recognition confidence], when C1 is smaller than the predetermined threshold T1 (it is NO at step S1108), it progresses to step S1110. At step S1109, the recognition result 1 is chosen as a recognition result. At step S1110, the recognition result 2 is chosen as a selection result. As mentioned above, the character recognition of all the lines contained in a block is completed by performing recognition processing of step S1106 - step S1110 to all lines.
[0048] As explained above, according to the gestalt 1 of operation, the character recognition section 1 for Japanese and the character recognition section 2 for English are formed, and recognition processing of a reading manuscript is performed in each recognition section in juxtaposition. And character recognition can be performed by determining a recognition result based on C1 whenever [recognition confidence / which can be found by the recognition section 1], without checking whether a reading manuscript is English or it is Japanese, before a user makes a read station 118 read a reading manuscript.
[0049] In addition, it is also easily possible to constitute from a read station 118 which does not depend in the direction of a reading manuscript at a read station 118 by detecting the direction of the image data at the time of reading of the image data which is a text or a title. As the detection method of the direction of image data, the line (image data) which performed 0-degree rotation, 90-degree rotation, 180-degree rotation, and 270-degree rotation for

the line (image data) which extracted a certain line (image data) and was extracted from the block which is the text or title extracted according to field separation is gained, for example. And it reads by the read station 118 to the image data gained, respectively. Consequently, what is necessary is to detect the direction of the image data which is a text or a title, and just to rotate a reading manuscript by obtaining whenever [recognition / of each rotation to the read image data], based on the detected direction.

[0050] In addition, processing of the flow chart of drawing 3 of the gestalt 1 of operation may be hereafter performed by the processing to which it is explained with the flow chart of drawing 11 . In addition, in drawing 11 , since processing of step S1301 to the step S1305 is the same as processing of step S1101 to the step S1105 of drawing 11 , the explanation is omitted.

[0051] At step S1306, by the recognition section 1, character recognition is carried out and C1 is calculated whenever [recognition result 1 and recognition confidence]. At step S1307, C1 judges whether it is larger than the predetermined threshold T1 whenever [recognition confidence]. Whenever [recognition confidence], when C1 is larger than the predetermined threshold T1 (it is YES at step S1307), it progresses to step S1308. Whenever [recognition confidence], when C1 is smaller than the predetermined threshold T1 (it is NO at step S1307), it progresses to step S1309. At step S1308, the recognition result 1 is chosen as a recognition result.

[0052] On the other hand, at step S1309, by the recognition section 2, character recognition is carried out and C2 is calculated whenever [recognition result 2 and recognition confidence]. At step S1310, the recognition result 2 is chosen as a recognition result. As mentioned above, the character recognition of all the lines contained in a block is completed by performing recognition processing of step S1306 - step S1310 to all lines. By performing processing explained by drawing 11 , the character recognition in the recognition section 2 is step S1307, and is performed only only within the case where C1 is less than [predetermined / threshold T1] whenever [recognition confidence]. Therefore, since it is not necessary to perform processing by the recognition section 2 when character recognition is completed only by the recognition processing depended recognition result 1, improvement in the speed of processing can be attained.

[0053] In addition, with the gestalt 1 of operation, although C1 was outputted whenever [in the recognition section 1 / recognition confidence], it does not restrict to this. For example, as shown in drawing 12 , you may make it the configuration which outputs C2 ((d) of drawing) whenever [recognition confidence] by the recognition section 2. In this case, in the judgment section 104, a judgment signal is outputted to a selector 105 so that C2 may be compared [whenever / recognition confidence] whenever [C1 and recognition confidence] and the higher one of whenever [recognition confidence] may be outputted as a recognition result. Consequently, the direction with a sufficient recognition result is chosen by the selector 105 as a recognition result. Moreover, what is necessary is just to compare the recognition result by each recognition section, after equipping the judgment section 104 with the transducer (un-illustrating) which makes both range or positioning equivalent and passing through processing of the transducer, when positioning differs from the range of whenever [recognition confidence / of the recognition section 1 and the recognition section 2]. In addition, although character recognition was performed with the gestalt 1 of operation for each [makes a line unit the character recognition unit of the block judged to be a title or a text in the recognition section, and are contained in the block] line of every, it does not restrict to this. For example, the 1st line of the block judged to be a title or a text is extracted, and character recognition processing by the recognition section 1 and the recognition section 2 is performed to oneth of them. And if either the recognition section 1 or the recognition section 2 is chosen as a recognition result, character recognition may be performed to all the image data remainder within the block using the selected recognition section.

[0054] Moreover, the projection of direction HE of the y-axis extracts a line for the image data of the block judged to be a title or a text, and the projection of direction HE of a x axis extracts an alphabetic character. And arbitration extracts by m characters out of the block divided into the line and the alphabetic character, and character recognition processing by the recognition section 1 and the recognition section 2 is performed to the m extracted characters. And if either the recognition section 1 or the recognition section 2 is chosen as a recognition result, character recognition may be performed to all the image data remainder within the block using the selected recognition section.

[0055] By making it such a configuration, the processing time concerning character recognition processing can be decreased. In addition, with the gestalt 1 of operation, although the image data which performs field separation processing by the recognition unit logging section 101 of drawing 2 was 1-pixel a 1-bit image, it is not restricted to this. For example, field separation can also be performed about a 8-bit 1-pixel multiple-value image. The field separation processing in this case is covering a differentiation filter to image data, extracts the high frequency component of image data, and performs field separation to text data and an image data from the obtained result.

Moreover, like the gestalt 1 of operation, when English and Japanese need to be distinguished, after using 8-bit 1-pixel multiple-value image data as binary-ized data on the basis of a fixed threshold, field separation processing is performed.

[0056] With the gestalt 1 of the <gestalt 2 of operation> operation, it has the recognition section the object for Japanese, and for English, respectively, and although it was the configuration of performing character recognition of Japanese and English, character recognition of two or more language which is not restricted to Japanese and English can be performed to coincidence by extending and having each recognition section to two or more language.

[0057] For example, as shown in drawing 13 , the recognition section 1 (102) to each language of n (n is positive integer) individual, the recognition section 2 (103), --, the recognition section n (106) are prepared. And the recognition result 1, the recognition result 2, --, the recognition result n are outputted to a selector 105 from each recognition section 1 (102) - the recognition section n (106). Moreover, Cn is outputted [whenever / recognition confidence / whenever / C1 and recognition confidence] to the judgment section 104 whenever [C2 --, and recognition confidence]. The judgment section 104 compares C1-Cn whenever [recognition confidence / which was inputted], and outputs the judgment signal of a log2 (n) bit to a selector 105 based on the result. And one selector 105 is chosen from the recognition result 1 - n as a recognition result according to a judgment signal.

[0058] For example, the character recognition processing in the case of consisting of the three recognition sections is explained using the flow chart of drawing 14 . Drawing 14 is a flow chart which shows the processing flow of the gestalt 2 of operation. At step S1501, field separation depended for every recognition unit of image data in the recognition unit logging section 101 is performed. It judges whether at step S1502, character recognition processing is completed about each block divided according to field separation at step 1501. Processing is ended when character recognition processing is not completed about each block (it is NO at step S1502). When character recognition is not completed about each block (it is YES at step S1502), it progresses to step S1503.

[0059] At step S1503, by the recognition section 1, character recognition is carried out and C1 is calculated whenever [recognition result 1 and recognition confidence]. At step S1504, C1 judges whether it is larger than the predetermined threshold T1 whenever [recognition confidence]. Whenever [recognition confidence], when C1 is larger than the predetermined threshold T1 (it is YES at step S1504), it progresses to step S1505. Whenever [recognition confidence], when C1 is smaller than the predetermined threshold T1 (it is NO at step S1504), it progresses to step S1506. At step S1505, the recognition result 1 is chosen as a recognition result.

[0060] At step S1506, by the recognition section 2, character recognition is carried out and C2 is calculated whenever [recognition result 2 and recognition confidence]. At step S1507, C2 judges whether it is larger than the predetermined threshold T2 whenever [recognition confidence]. Whenever [recognition confidence], when C2 is larger than the predetermined threshold T2 (it is YES at step S1507), it progresses to step S1508. Whenever [recognition confidence], when C2 is smaller than the predetermined threshold T2 (it is NO at step S1507), it progresses to step S1509. At step S1508, the recognition result 1 is chosen as a recognition result.

[0061] At step S1509, by the recognition section 3, character recognition is carried out and the recognition result 3 is searched for. At step S1510, the recognition result 3 is chosen as a recognition result. As mentioned above, recognition processing of each block is completed by carrying out recognition processing of step S1504 - step S1510 to all blocks. In addition, with the gestalt 2 of operation, although the recognition section was made into three pieces, it does not restrict to this. According to the number of two or more language which wants to perform recognition, without limit is extensible. For example, if Tn costs whenever [recognition result / of the recognition section n / Cn, and recognition confidence] when it consists of the n recognition sections, if the conditions of Cn>=Tn fulfill, the processing by the recognition section after the recognition section (n+1) which does not choose and fulfill the recognition result n if it becomes will perform, and it will choose considering the recognition result of the recognition section which fulfills above-mentioned conditions in each recognition section as a recognition result.

[0062] Moreover, although the sequence which the recognition section 1 - n make recognize shall follow in order of predetermined [beforehand regular], every time it responds to a user's use, it shall change the sequence through input units, such as a keyboard. As explained above, according to the gestalt 2 of operation, it becomes possible to perform character recognition of two or more language to coincidence by preparing the recognition section corresponding to two or more language.

[0063] In addition, storages, such as FD which made the program of the gestalt of the above-mentioned operation memorize, can also attain the purpose of this invention attained by the function of Above FDD, or the function of a method. That is, it is because the program itself which equipped Above FDD with the storage and was read from the storage to it attains the new function of this invention. The program structure-feature concerning this invention for

this is as being shown in drawing 15 and drawing 16 .
[0064] In order to realize control of the gestalt 1 of operation, five modules are consisted of by FD as shown in drawing 15 . As shown in drawing, it is five, the recognition module 1011, the activation module 1012, the acquisition module 1013, the selection module 1014, and the output module 1015. According to the module memorized by this storage, processing is performed in order of the step S1001 as shown in drawing 15 - step S1005, "recognition", "activation", "acquisition", "selection", and an "output." In the module memorized by each storage, "recognition" (step S1001) processing performed by the recognition module 1011 corresponds to step S1101 of the flow chart of drawing 3 - step S1105.
[0065] "Activation" (step S1002) processing performed by the activation module 1012 and "acquisition" (step S1003) processing performed by the acquisition module 1013 correspond to step S1106 of the flow chart of drawing 3 . "Selection" (step S1004) processing performed by the selection module 1014 corresponds to step S1108 of the flow chart of drawing 3 . The "output" (step S1005) processing performed by the output module 1014 corresponds to step S1109 of the flow chart of drawing 3 , and step S1110.
[0066] Moreover, in order to realize control of the gestalt 2 of operation, six modules are consisted of by FD as shown in drawing 16 . As shown in drawing, it is six, the recognition module 2011, the activation module 2012, the acquisition module 2013, the comparison module 2014, the output module 2015, and a control module 2016. According to the module memorized by this storage, processing is performed in order of the step S2001 as shown in drawing 16 - step S2006, "recognition", "activation", "acquisition", "a comparison", an "output", and "control." In the module memorized by each storage, "recognition" (step S2001) processing performed by the recognition module 2011 corresponds to step S1501 of the flow chart of drawing 14 , and step S1502.
[0067] "Activation" (step S2002) processing performed by the activation module 2012 and "acquisition" (step S2003) processing performed by the acquisition module 2013 correspond to step S1503 of the flow chart of drawing 14 . "Selection" (step S2004) processing performed by the selection module 2014 corresponds to step S1504 of the flow chart of drawing 14 . The "output" (step S2005) processing performed by the output module 2015 corresponds to step S1505 of the flow chart of drawing 14 . "Control" (step S2006) processing performed with a control module 2016 corresponds to step S1506 of the flow chart of drawing 14 - step S1510.
[0068] Moreover, even if it applies this invention to the system which consists of two or more devices, it may be applied to the equipment which consists of one device. Moreover, it cannot be overemphasized that this invention can be applied also when carrying out by supplying a program to a system or equipment. In this case, the storage which stored the program concerning this invention will constitute this invention. And the system or equipment operates by the method defined beforehand by reading the program from this storage to a system or equipment.
[0069]
[Effect of the Invention] According to this invention, the character reader which makes possible character recognition of the alphabetic character used for each of two or more language, and improves the processing speed of character recognition, and its method can be offered so that clearly also from the above explanation.

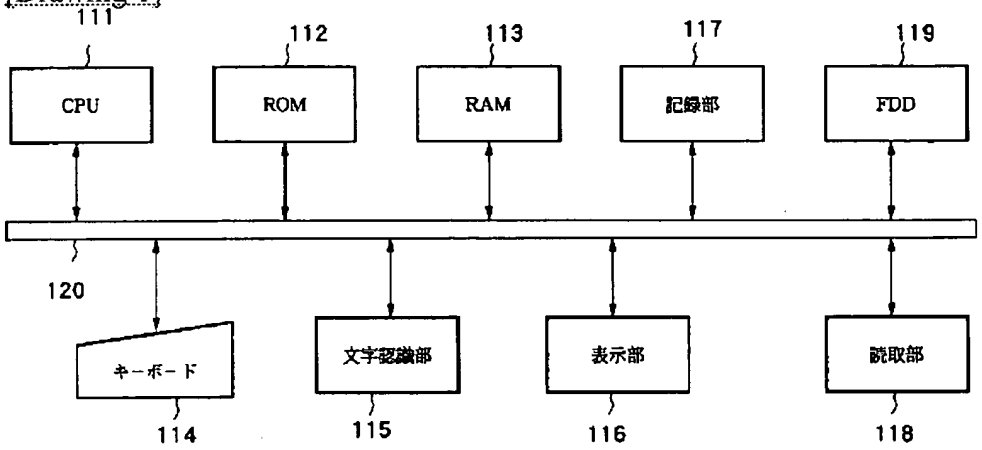
[Translation done.]

* NOTICES *

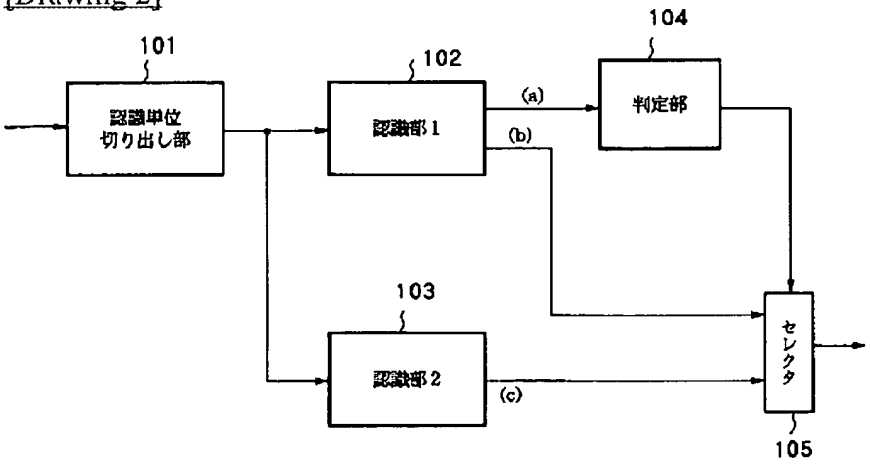
1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

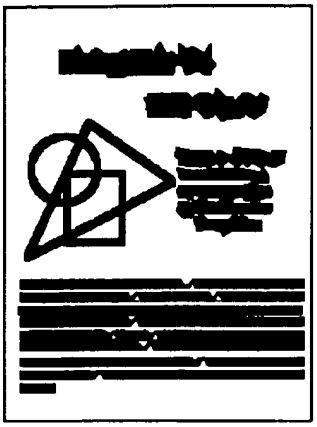
[Drawing 1]



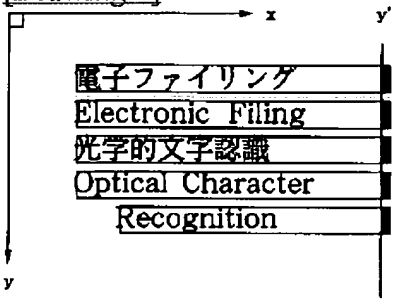
[Drawing 2]



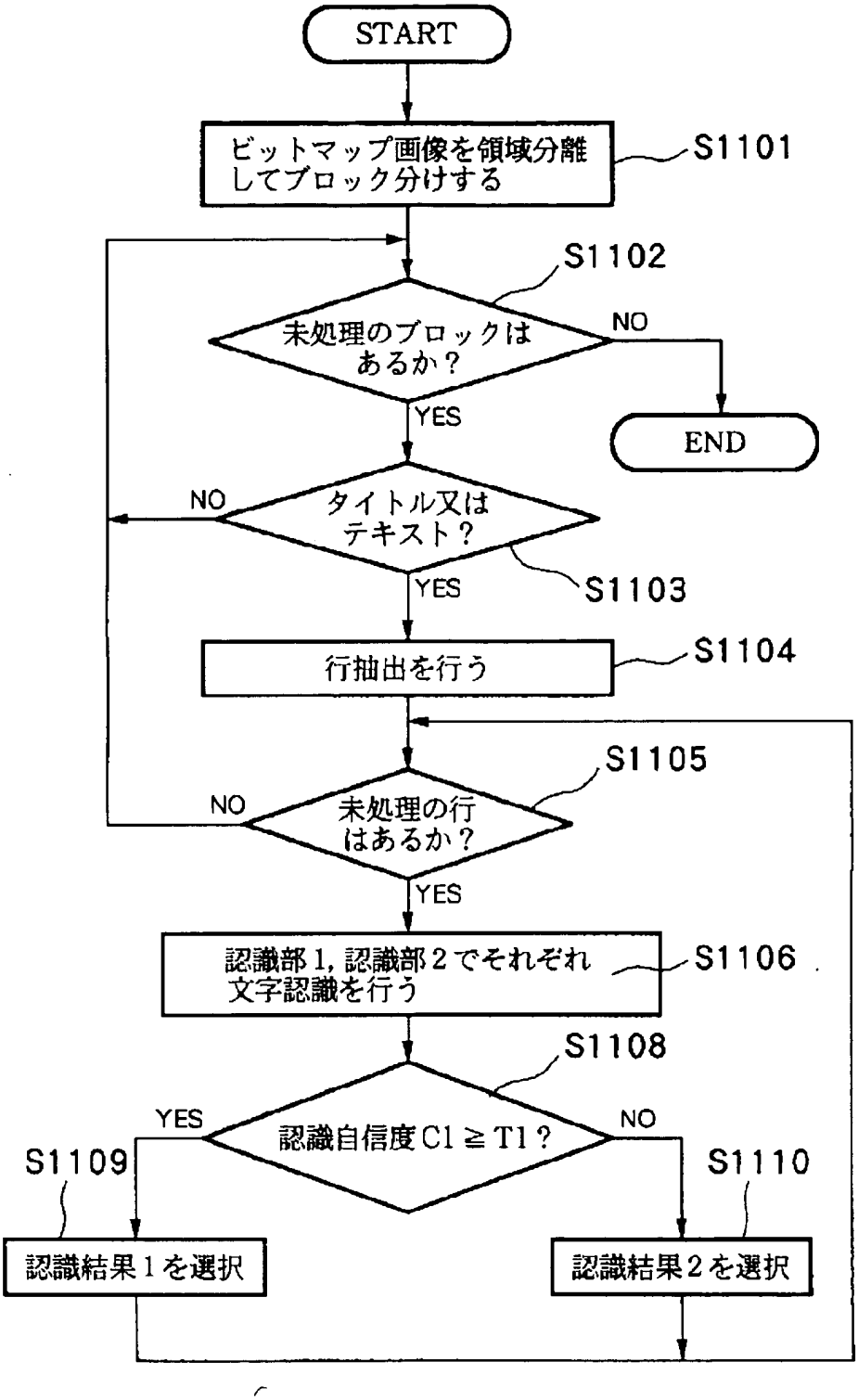
[Drawing 6]



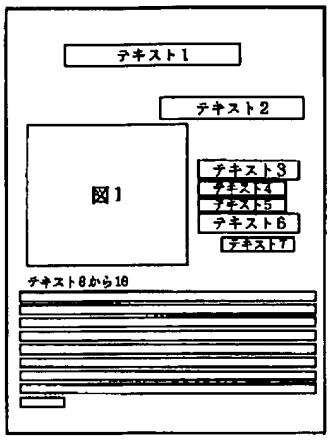
[Drawing 8]



[Drawing 3]

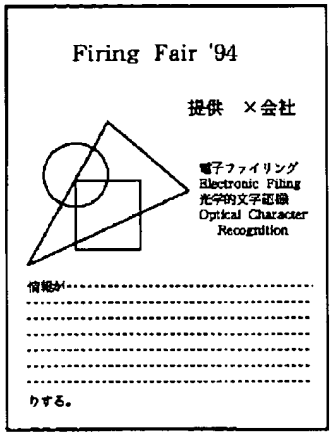

START
ビットマップ画像を領域分離してブロック分けする
S1101
S1102
未処理のブロックはあるか？
NO
YES
END
タイトル又はテキスト？
NO
YES
S1103
行抽出を行う
S1104
S1105
未処理の行はあるか？
NO
YES
認識部1，認識部2でそれぞれ文字認識を行う
S1106
S1108
認識自信度C1 ≧ T1？
YES
NO
S1109
S1110
認識結果1を選択
認識結果2を選択

[Drawing 10]

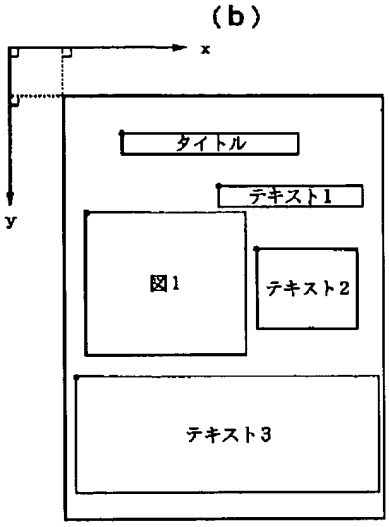


[Drawing 4]

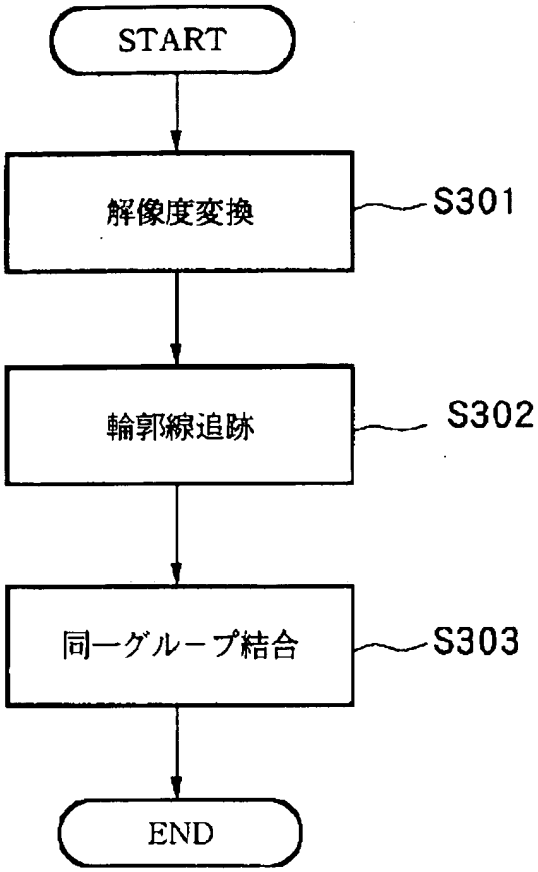
(a)



(b)



[Drawing 5]



[Drawing 7]

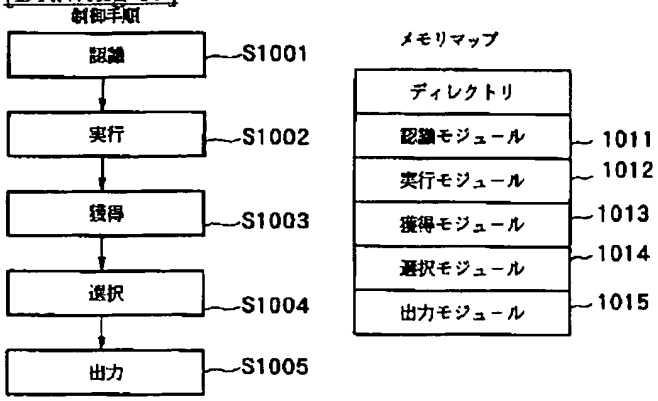
(a)

```
struct BLOCK {
        short type ;/ *0=TYTLE,1=TEXT,
                      2=FIGURE, 3=PICTURE*/
        short startx,starty ;
        short width,height ;
        struct BLOCK *next_address ;
} BLOCK ;
```

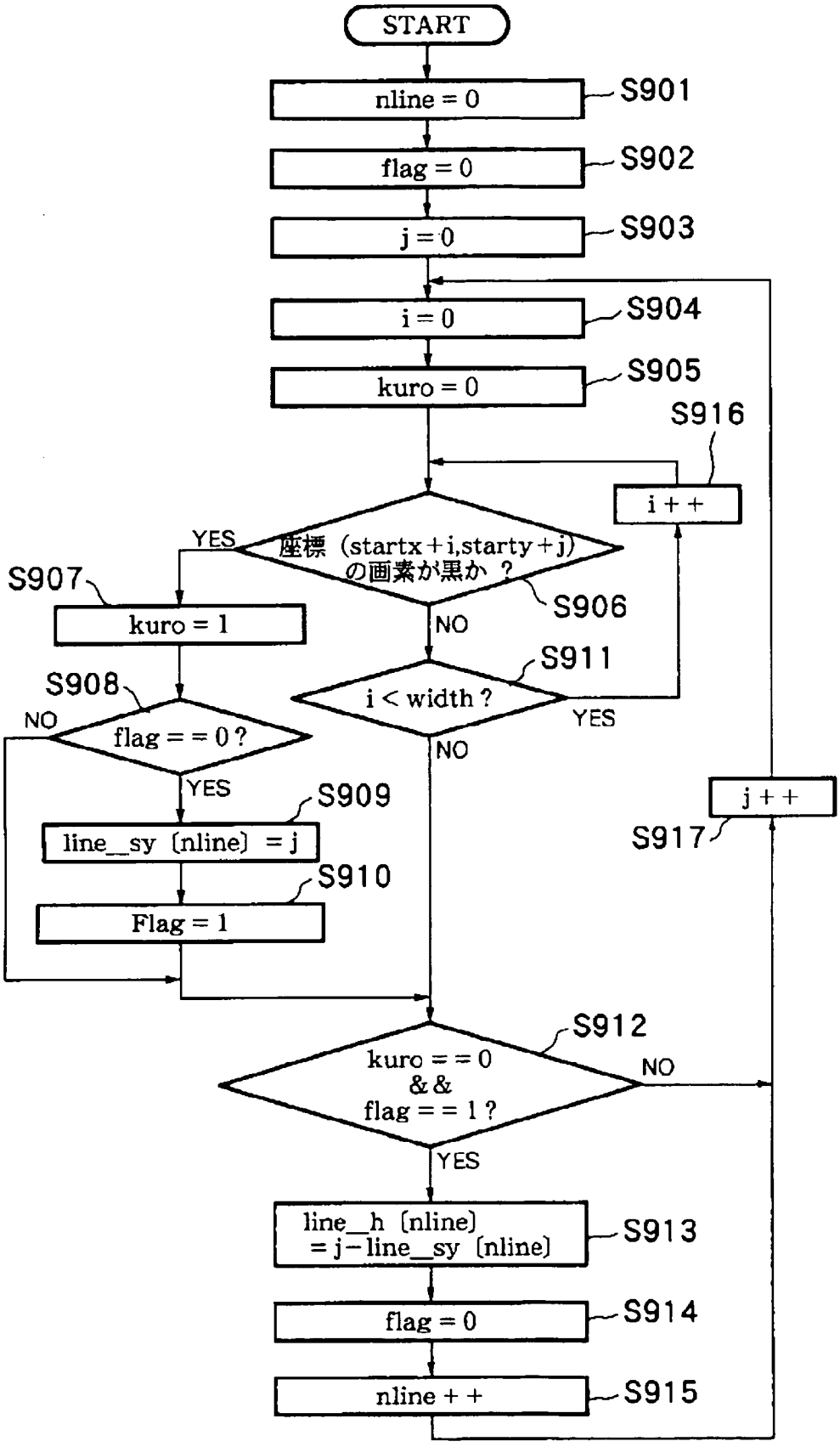
(b)

```
BLK [0].type=0 ;
        .startx=500 ;
        .starty=300 ;
        .width=1500 ;
        .height=250 ;
        .next_address=& BLK [1].type
BLK [1].type=1 ;
        .startx=1400 ;
        .starty=1000 ;
        .width=1450 ;
        .height=250 ;
        .next_address=& BLK [2].type
BLK [2].type=2 ;
        .startx=150 ;
        .starty=1300 ;
        .width=1500 ;
        .height=1400 ;
        .next_address=& BLK [3].type
BLK [3].type=1 ;
        .startx=1700 ;
        .starty=1500 ;
        .width=1000 ;
        .height=800 ;
        .next_address=& BLK [4].type
BLK [4].type=1 ;
        .startx=100 ;
        .starty=2900 ;
        .width=2800 ;
        .height=1200 ;
        .next_address=NULL
```

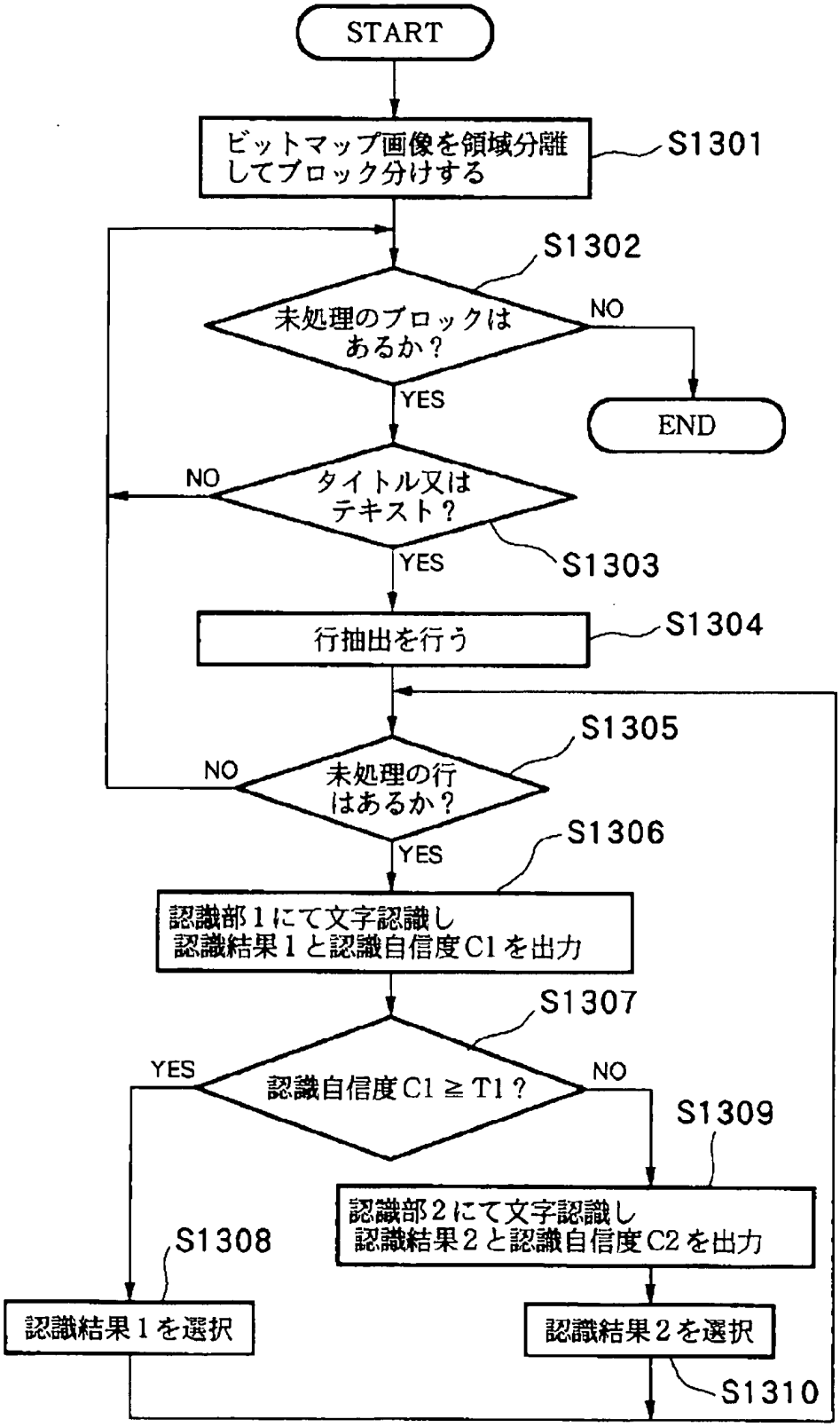
[Drawing 15]



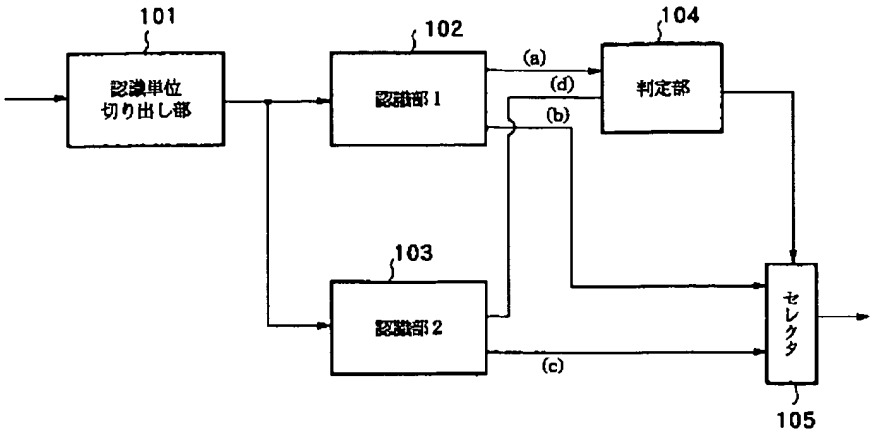
[Drawing 9]


START
nline = 0
S901
flag = 0
S902
j = 0
S903
i = 0
S904
kuro = 0
S905
S916
i + +
YES
座標 (startx + i,starty + j)
の画素が黒か ?
S906
S907
kuro = 1
NO
S911
S908
i < width ?
NO
YES
flag = = 0 ?
YES
S909
line_sy [nline] = j
S910
Flag = 1
j + +
S917
S912
kuro = = 0
& &
flag = = 1 ?
NO
YES
line_h [nline]
= j − line_sy [nline]
S913
flag = 0
S914
nline + +
S915

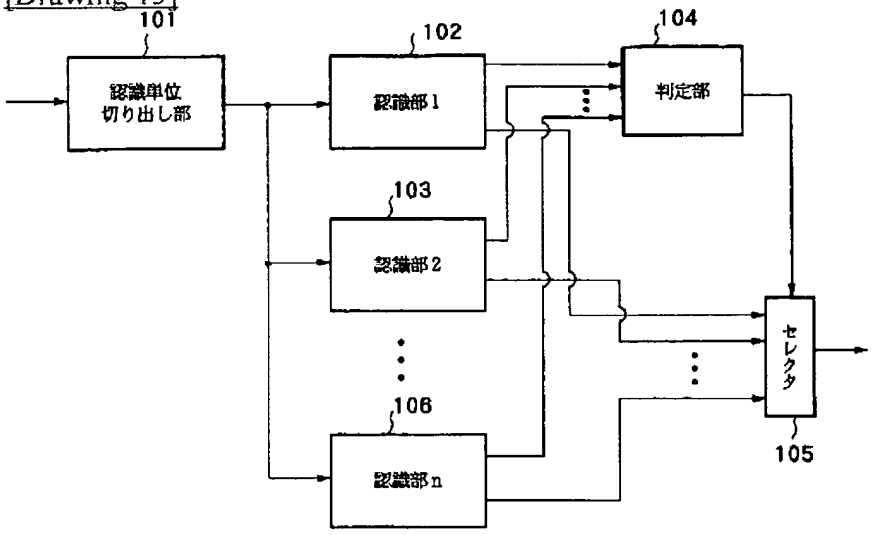
[Drawing 11]


START
ビットマップ画像を領域分離してブロック分けする
S1301
S1302
未処理のブロックはあるか？
NO
YES
END
タイトル又はテキスト？
NO
YES
S1303
行抽出を行う
S1304
S1305
未処理の行はあるか？
NO
YES
S1306
認識部1にて文字認識し認識結果1と認識自信度C1を出力
S1307
認識自信度C1 ≧ T1？
YES
NO
S1309
認識部2にて文字認識し認識結果2と認識自信度C2を出力
S1308
認識結果1を選択
認識結果2を選択
S1310

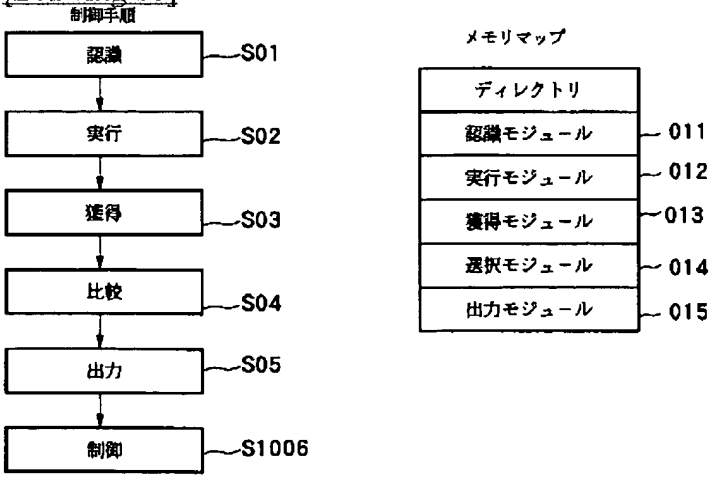
[Drawing 12]



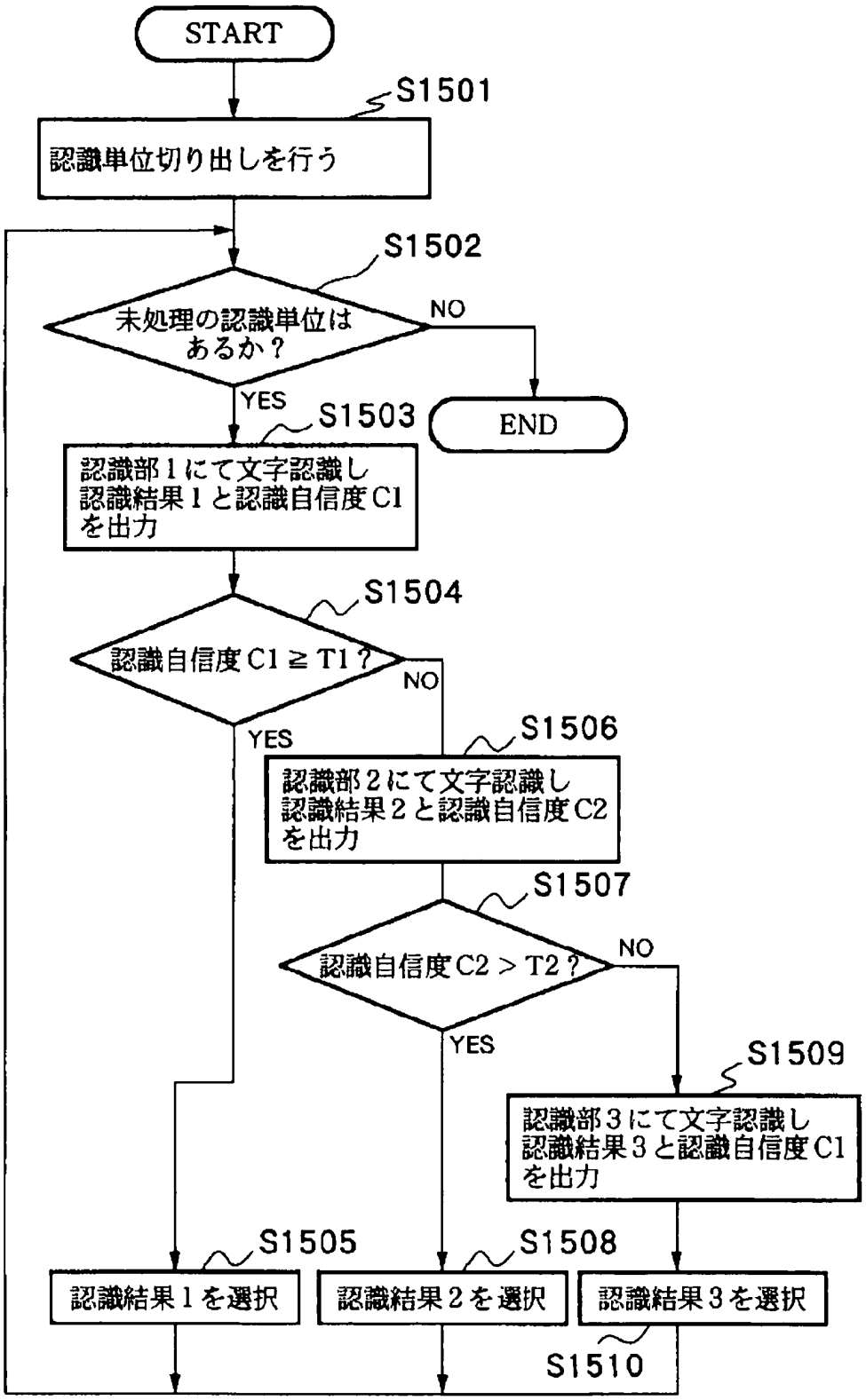
[Drawing 13]



[Drawing 16]



[Drawing 14]



[Translation done.]